Comparison of Topics Covered in Grade 4 Mathematics Assessments:
NAEP, ITBS, ICAM, ITBS Constructed Response

Iowa K-12 Core Content Standards and Benchmarks Corresponding to the Iowa Tests: Math Content Standards	**NAEP Grade 4 Mathematics Format: Contains both selected response and constructed response items (NAGB, not dated)**		**ITBS Level 10 Mathematics Total comprised of two subtests: Math Concepts and Estimation Skills (36 questions) and Math Problem Solving and Data Interpretation Skills (24 questions) Format: Contains selected response items only (ITP, 2003)**		**ICAM: Fourth-Grade Mathematics includes 7 modules: Problem-Solving Strategies and Process; Number Concepts and Operations; Measurement; Geometry; Data Interpretation, Statistics, and Probability; Patterns, Functions, and Algebra; Solving Work-Related Math Problems Format: Contains both selected response and constructed response items (ICM, 2003)**		**ITBS Constructed Response Supplement: Thinking about Mathematics, Level 10 Format: Contains constructed response items only (ITP, not dated)**	
A. Students can understand and apply a variety of math concepts.	**Number Sense, Properties, and Operations**	40%-70%	**Number Properties and Operations**	11 questions	**Number Concepts and Operations (module 2)**	20 points	**Concepts/Estimation**	8 points out of 20
	Relate counting, grouping, and place value -Use place value to model and describe whole numbers and decimals		Use place value and write numbers in expanded and exponential form (2 questions) Represent, compare, and order numbers (3 questions)		Understands the meaning of place value and rounds whole numbers (e.g., nearest hundred or thousand) (number concepts and operations, 3 points)			
	Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols -Model numbers using set models such as counters -Model numbers using number lines -Use two- and three-dimensional region models to describe numbers -Use other models as appropriate -Read write, rename, order, and compare numbers							
	Compute with numbers (that is, add, subtract, multiply, divide)		Perform operations (3 questions)		Knows the concept of basic operations and understands the relationships among arithmetic operations (e.g.,			

	-Apply basic properties of operations -Describe features of algorithms -Select appropriate computation method				inverse operations, multiplication is repeated addition) (number concepts and operations – 2 points) Understands whole numbers, fractions, decimals, percents, and mixed numbers and the relationships among them and their equivalent representation (number concepts and operations, 6 points)			
A1. Understand and apply number properties and operations. B. Students can understand and apply methods of estimations. C. Students can solve a variety of math problems.	Use computation and estimation in applications -Round whole numbers, decimals, and fractions in meaningful contexts -Make estimates appropriate to a given situation -Select appropriate method of estimation -Solve application problems involving numbers and operations using exact answers or estimates as appropriate -Verify solutions and determine the reasonableness of results		**Estimation** Use standard rounding (4 questions) Use order of magnitude (2 questions) **Problem Solving** Single step (3 questions) Multiple step (7 questions) Approaches and procedures: -Indentify insufficient information -Choose solution methods (4 questions)	12 questions 14 questions	Solves problems using number concepts (e.g., relative magnitude, equivalent forms, factors and multiples, place value, and rounding) (number concepts and operations, 9 points) **Problem Solving Strategies and Process (module 1)** Translates verbal situations into mathematical language and symbols (problem-solving strategies and process, 3 points) Uses strategies to understand and solve problems (problem-solving strategies and process, 16 points) Identifies relevant and irrelevant information when solving problems (problem-solving strategies and process, 1 point) **Solving Work-Related Math Problems (module 7)** Solves work-related mathematics problems using a variety of basic mathematical concepts and	20 points 19 points	**Estimation (1 question)** **Problem Solving/Data Interpretation/Reasoning** Problem Solving (5 questions)	12 points out of 20

					computations (solving work-related math problems, 19 points)			
	Apply ratios and proportional thinking in a variety of situation -Use ratios to describe situations -Understand the meaning of percentage		Use number sense (2 questions)					
	Use elementary number theory -Describe odd and even numbers and their characteristics -Describe number patterns		Classify numbers by divisibility (2 questions) Describe and apply properties of numbers (1 question)				Concepts (6 questions)	
A4. Students can understand and apply concepts of measurement.	**Measurement**	20%	**Measurement**	3 questions	**Measurement (module 3)**	20 points		
	Estimate the size of an object with respect to a given measurement attribute (e.g., length or perimeter).		Estimate measurements with appropriate precision (1 question)		Knows approximate size of basic standard units of measure and the relationships between them, selects and uses appropriate units of measurement (metric and standard) according to type and size of unit and estimates quantities and measurements (measurement, 3- 4 points)			
	Select and use appropriate measurement instruments such as ruler, meter stick, clock, thermometer, or other scaled instruments.				Uses measurement tools appropriately (e.g., thermometer, scale, rule, clock) for given situations (measurement, 3 points)			
	Select and use appropriate units of measurement according type and size of unit		Measure length/distance, time, temperature, weight, mass, and volume (1 question)		Tells time to the nearest minute and calculates elapsed time by using both types of clocks (measurement, 3- 4 points)			
	Estimate, calculate or compare perimeter, area, volume, and surface area in				Solve problems involving the basic measure of length, perimeter (circumference),			

	volume, and surface area in meaningful contexts to solve mathematical and real-world problems				area, and volume (measurement, 2 points)			
	Select appropriate methods of measurement (such as direct or indirect)		Identify and uses appropriate units of measurement (1 question)					
					Solves problems involving money and making change (measurement, 8 points)			
A3. Students can understand and apply concepts of geometry.	**Geometry**	15%	**Geometry**	5 questions	**Geometry (module 4)**	20 points		
	Describe, visualize, draw, and construct geometric figures -Draw or sketch a figure given a verbal description (open-ended items)		Apply concepts of perimeter, area, and volume (1 question)					
	Investigate and predict results of combining, subdividing, and changing shapes							
	Identify the relationship (congruence, similarity) between a figure and its image under a transformation -Use motion geometry		Describe geometric properties, patterns, and relationships (2 questions)		Understands basic properties of two- or three-dimensional figures (e.g., dimensionality, number of faces, symmetry, congruency) and knows the geometric language for describing and naming them (geometry, 14 points)			
	Apply geometric properties and relationships in solving problems -Use concepts of "between," "inside," "on," and "outside"							
	Establish and explain relationships involving geometric concepts -Make conjectures							

	-Validate and justify conclusions and generalizations -Use informal induction and deduction							
	Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems							
A5. Students can understand and apply concepts in probability and statistics.	**Data Analysis, Statistics, and Probability**	10%	**Probability and Statistics**	3 questions	**Data Interpretation, Statistics, and Probability (module 5)**	20 points	Data Interpretation (4 questions)	
			Data Interpretation	10 questions				
D. Students can interpret data presented in a variety of ways. D1. Students can use tables and graphs to locate and read information. D2. Students can interpret data from a variety of sources.	Read, interpret, and make predictions using tables and graphs -Read and interpret data -Solve problems by estimating and computing with data		Read Amounts -On the scales of bar and line graphs (2 questions) -By locating a specific cell in a table (1 question)		Reads and interprets data in simple tables and graphs (e.g., bar graphs, pictographs, pie charts, and line graphs) (data interpretation, statistics, and probability, 4 points)			
	Organize and display data and make inferences -Use tables, histograms, pictograms, and line graphs		Compare quantities -To determine rank (2 questions) -To determine sums and differences (2 questions) -To find ratios (1 question) Interpret relationships and trends -To understand underlying and functional relationships (1 question)		Organizes and displays data in simple bar graphs (data interpretation, statistics, and probability, 4 points)			

			-To generalize or draw conclusions (1 question)					
	Describe measure of central tendency and dispersion in real-world situations				Understands concepts of mode and range (data interpretation, statistics, and probability, 4 points)			
	Understand and reason about the use and misuse of statistics in our society -Given certain situations and reported results, identify faulty arguments or misleading presentations of the data -Appropriately apply statistics to real-world situations							
	Determine the probability of a simple event -Use sample spaces and the definition of probability to describe events							
	Apply the basic concept of probability to real-world situations -Use probabilistic thinking informally				Understands that the word "chance" refers to the likelihood of an event and recognizes events that are sure to happen, sure not to happen, and may or may not happen (data interpretation, statistics, and probability, 8 points)			
A2. Students can understand and apply concepts and procedures of algebra.	**Algebra and Functions**	15%	**Algebra**	6 questions	**Patterns, Functions, and Algebra (module 6)**	17 points		
	Describe, extend, interpolate, transform, and create a wide variety of patterns and functional relationships -Recognize patterns and sequences -Extend a pattern of		Understand and explore numerical patterns (2 questions)		Recognizes and extends a wide variety of patterns (e.g., basic linear patterns such as [2,4,6,8,…]; simple repeating and growing patterns) (patterns, functions, and algebra, 6 points) Solves problems using			

	functional relationship -Translate patters from one context to another -Create an example of a pattern or functional relationship -Understand and apply the concept of a variable				patterns (patterns, functions, and algebra, 4 points)			
	Use multiple representations for situations to translate among diagrams, models, and symbolic expressions							
	Use number lines and rectangular coordinate systems as representational tools -Identify or graph sets of points on a number line or in a rectangular coordinate system							
	Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems -Provide solution sets of whole numbers -Provide solution sets of real numbers		Use and interpret operational and relational symbols (1 question) Use expressions to model situations (2 questions) Solve equations and inequalities (1 question)		Knows that a variable is a letter or symbol that stands for one or more numbers and solves simple open sentences involving operations with whole numbers (patterns, functions, and algebra, 2 points)			
	Use mathematical reasoning -Make conjectures -Validate and justify conclusions and generalizations -Use informal induction and deduction				Understands the basic concept of an equality (i.e., an equation is a number sentence that shows two quantities that are equal) (patterns, functions, and algebra, 5 points)			